INSTRUCTION BOOK

for

TYPE 18

VHF TRANSMITTING EQUIPMENT

Manufactured by
AIRCRAFT RADIO CORPORATION
Boonton, N. J.

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JUNE 26, 1947

TABLE OF CONTENTS

Page

SECTION I—GENERAL DESCRIPTION

1. Introduction 5
2. Transmitting Crystals 5
3. Distance Range 5
4. Transmitter Power Output and Modulation Capability 5
5. Input Current 5
6. Weight 5

SECTION II—INSTALLATION

1. Bench Inspection Before Installation 6
2. Location of Units 6
3. Final Adjustment After Installation 6

SECTION III—OPERATION

1. Transmitter 8

SECTION IV—MECHANICAL AND ELECTRICAL CHARACTERISTICS

1. Type T-11A VHF Transmitter 10
2. Type P-10 Power Unit and Type D-10 Dynamotor Unit 10
3. Type C-13 Control Unit 10

SECTION V—MAINTENANCE

1. Preventive Maintenance 11
2. Servicing the Equipment 11

NOTE REGARDING TYPE 6AQ5 TUBES IN THE TRANSMITTER 13

SECTION VI—SUPPLEMENTARY DATA

Table 1. Typical List of Major Units and Accessories for Type 18 VHF Transmitting Equipment 14
Figures 3, 4, 5, 6 listed below ..... Back

LIST OF ILLUSTRATIONS

Figure 1—Principal Units, Type 18 VHF Transmitting Equipment 4
Figure 2—Top View of Transmitter, Tube Cover Removed 12
Figure 3—Schematic Circuit Diagram, Type 18 VHF Transmitting Equipment ..... Back
Figure 4—Cabling Diagram, Type 18 VHF Transmitting Equipment ..... Back
Figure 5—Installation Dimensions and Weights, Type 18 VHF Transmitting Equipment ..... Back
Figure 6—Instructions for Assembling Coax Cable ..... Back

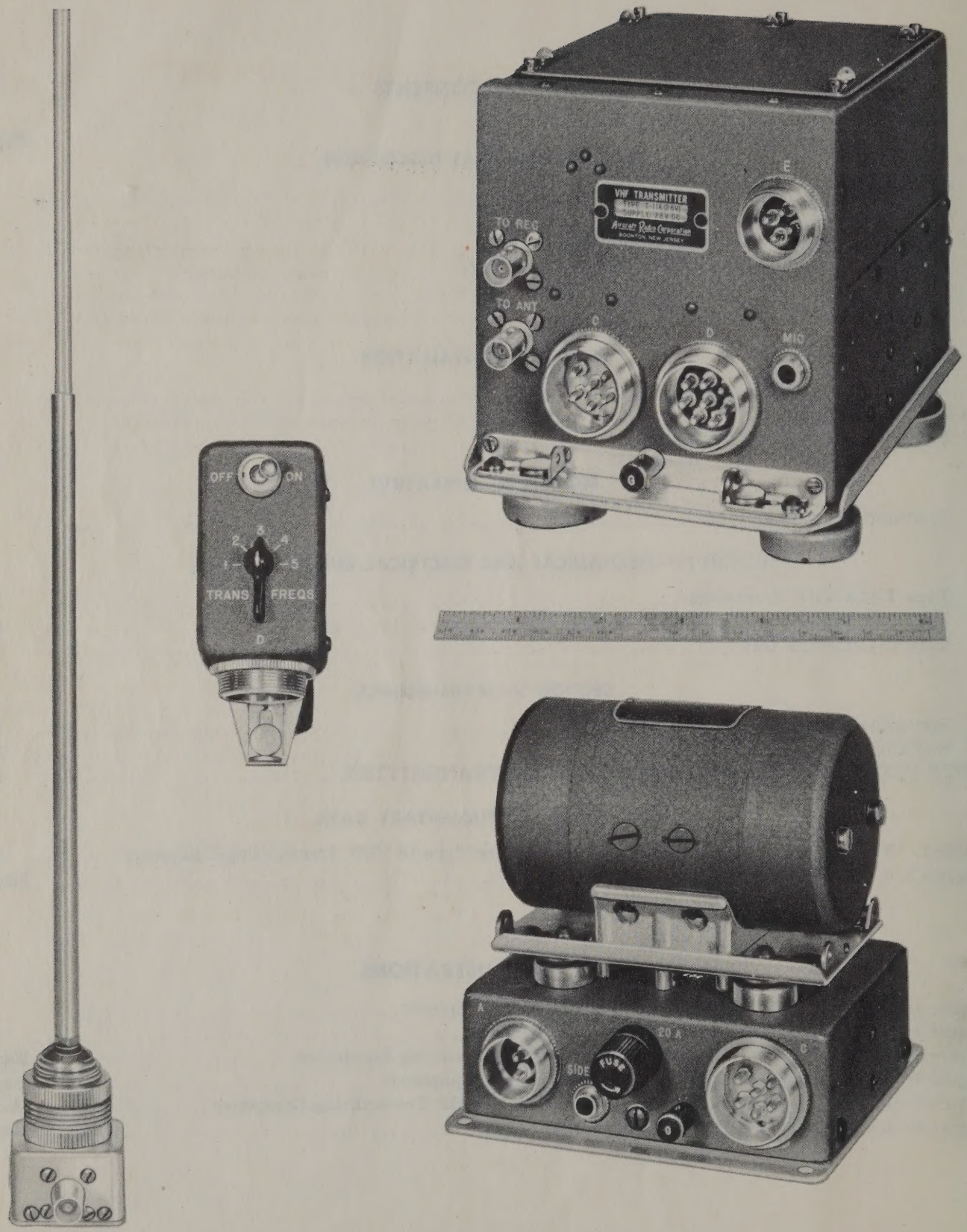

Figure 1—Principle Units, Type 18 VHF Transmitting Equipment

TYPE 18 VHF TRANSMITTING EQUIPMENT

SECTION I

GENERAL DESCRIPTION

1. INTRODUCTION

a. The Type 18 VHF Transmitting Equipment is a complete voice amplitude-modulated transmitting set for use on aircraft. The Transmitter is designed for operation on any five crystal-controlled frequencies in any one-megacycle band located between 121.5 and 132 megacycles. The equipment is type-certified by the C.A.A.

b. Two aggregates of units are available, one for operation on a 14-volt d-c power supply, and a second for operation on a 28-volt d-c power supply.

c. A photograph of the principal units of the equipment is shown in Figure 1, page 4, and a list of major units and accessories comprising the equipment is listed in Table 1, page 14.

d. Figures 3, 4, and 5 in the back of the book show the Schematic Circuit Diagram, Cabling Diagram, and Installation Dimensions and Weights respectively.

2. TRANSMITTING CRYSTALS

a. Unless other crystals are specifically ordered, Type 18 equipments are delivered with crystals for operation on 122.1 and 122.5 mc only, and Transmitters are tuned for operation on these frequencies.

3. DISTANCE RANGE

a. Under normal conditions the distance range is 30 miles at 3000 feet altitude and 60 miles at 6000 feet altitude, assuming normal receiving conditions.

4. TRANSMITTER POWER OUTPUT AND MODULATION CAPABILITY

a. The Transmitter unmodulated carrier power output exceeds one watt, and its voice-modulation capability exceeds 90%.

5. INPUT CURRENT

a. The total input to the system is

	Amps. at 14 v d-c	Amps. at 28 v d-c
while transmitting	4.8	2.4
Stand-by.....	2.4	1.2

6. WEIGHT

a. The weight of the entire equipment is 8 pounds, except for cables which vary with each installation. Table 1 on page 14 lists all items of the equipment. Figure 5 in the back of the book shows the dimensions and weights of each item.

b. The Type 18 equipment may be expanded to include additional Type T-11A VHF Transmitters, each adding 5 operating frequencies. The weight of each added Transmitter with mounting is 3.4 pounds. If three Transmitters are installed, covering 15 frequencies, the total weight will be 14.8 pounds.

SECTION II

INSTALLATION

1. BENCH INSPECTION BEFORE INSTALLATION

a. The equipment, including all accessories and cables, should be set up on a bench and checked for normal operation before being installed in the airplane. The cabling diagram, Figure 4, shows the proper connections between units.

2. LOCATION OF UNITS

See Figure 4 for the cabling and Figure 5 for the installation dimensions and weights, of the major units. The information in Figure 5 has been included to assist CAA-licensed airplane mechanics in the preparation of weight and balance forms after installation of the Type 18 equipment.

a. ANTENNA. *The Type A-12 Antenna Unit should never be installed on aircraft that will encounter icing.* Use the military "axhandle" antenna on aircraft that may fly under icing conditions. The VHF antenna may be located on either top or bottom of the fuselage. The top side is generally preferred because there is no danger of a wing blanking out transmission to a tower as the airplane circles the field in a bank. The VHF antenna must not be placed on the belly of a low airplane where it might get caught in tall grass. Keep the antenna a few feet away from the vertical fin. Keeping the antenna far from the engine is good practice if the engine is not perfectly shielded. If the antenna is close to a metal propeller, a distortion in the transmitted signal occurs, called "propeller modulation", which can be pretty severe. If the installation is made on a fabric-covered airplane, a "ground plane" must be installed around the antenna consisting of a square yard or more of copper screening grounded to the frame. As an alternate, install a series of grounded radial wires. Aluminum foil doped to the outer surface of the wing, and carefully grounded, has been used successfully. Radio power loss in the coaxial cable for lengths normally encountered in aircraft are not important, hence the choice of location of the antenna should not be weighted heavily by the location of the VHF Transmitter.

b. CONTROL UNIT. This unit is the only one that must be mounted in the cockpit. It should be within convenient reach of the pilot.

c. TRANSMITTER AND POWER UNIT. The location of the Transmitter and Power Unit is determined only by the balance of the airplane and the desirability of reasonable accessibility and short cables. It may even be desirable to sacrifice a certain amount of accessibility to reduce possible damage due to tinkering by non-technical people.

d. In some installations the VHF Transmitter will be but one of several transmitters in the airplane. In these cases the microphone and key leads from the transmitters will have to be connected to a microphone selector switch so that the pilot can select the proper transmitter. If there are two transmitters, a simple double pole double throw toggle switch may be used, but if there are three it will require a double pole triple throw switch such as the A.R.C. #9912 "music-box" unit, or possibly a wafer-type switch.

e. BRACKET FOR MICROPHONE. This bracket should be located in such a position that the microphone cannot easily be knocked off and tangled in the controls. It should, of course, be readily accessible.

f. CABLES. Cables should not be so short that a strain is placed on them or on the units to which they are connected, nor so long that they have to be coiled up. Securely fasten all cables to prevent them from becoming tangled in controls.

g. BATTERY CABLE. The battery cable should be as short as possible to avoid excessive voltage drop in the leads which results in lower power output from the Transmitter.

3. FINAL ADJUSTMENT AFTER INSTALLATION

a. TRANSMITTER. Tune the Transmitter as follows:

(1) Turn on the power switch.

(2) Set TRANS FREQS switch to the position corresponding closest to the central operating frequency. (When there are five crystals in the Transmitter, set this switch to #3 position.)

(3) Remove the tube cover and connect the + lead of a 3-volt d-c voltmeter (1000 ohms per volt) to the pin jack on the right front of the chassis. Connect the − lead of the voltmeter to a grounded metal member of the airplane or radio equipment.

(4) Press the "press-to-talk" button on the microphone.

(5) Using a screwdriver, turn the adjusting screw #3, on the left front of the chassis, for a maximum voltmeter reading.

(6) Adjust screws #1 and #2 for a maximum reading on the voltmeter. The order in which this is done is immaterial.

(7) Repeat (5) and (6). If the equipment is normal with the input at 14 (or 28) volts, and with a 1000 ohms per volt voltmeter, the reading should be 1.5 to 2.0 volts. If the input is 11 (or 22) volts, the voltmeter reading may be as low as 1.3 volts.

CAUTION

If the voltmeter reading is over 2 volts it is possible that the antenna circuit is open,—possibly as open in the coax.

(8) Speak into the microphone and note a rise of 10–20% in voltmeter reading, for a check on the microphone and modulation circuits.

(9) Turn TRANS. FREQS. switch to each operating position and observe that the voltmeter reading is substantially the same, but do not make further adjustments.

(10) Remove the voltmeter and replace the tube cover.

(11) Some radiomen have used the "RFL Model 200 RF Probe" to make a final check on the Transmitter output. The probe may be held in the hand several feet from the antenna, on the outside of the airplane. It is a quick way to make certain there is no radiation on positions of the TRANS. FREQS. switch for which no crystal is installed, and that a sufficiently strong field is obtained on each of the operating frequencies. A little experience with an equipment known to be operating properly is required for proper judgment. The "Model 200 RF Probe" is manufactured by Radio Frequency Laboratories, Boonton, N. J., and may be purchased directly from them.

b. ANTENNA

(1) The Type A-12 Antenna Unit, as delivered, is 25 inches in length. This length is best suited to operation near the low frequency end of the Transmitter range (122.5 mc) but is so nearly optimum at the 132 mc end of the Transmitter range that modification of the length is not recommended.

SECTION III

OPERATION

1. TRANSMITTER

a. THE FEDERAL COMMUNICATIONS COMMISSION HAS REQUESTED THIS COMPANY TO STATE THAT IT IS UNLAWFUL FOR ANYONE TO OPERATE A RADIO TRANSMITTER WITHOUT AN OPERATOR'S LICENSE AND A STATION LICENSE. Aircraft Radio Corporation assists each owner of Type 18 equipment to obtain an operator's and a station license by including application forms for both licenses. Fill out the "Application for Non-Scheduled Aircraft Radio Station License," Form 404A, under paragraphs 2 and 11 as follows:

Manufacturer: Aircraft Radio Corporation
Type: T-11A VHF Transmitter
Model Number: None

Satisfactory information for paragraphs 12 to 16 on the same form is as follows:

"All technical information is on file with FCC".

b. RADIOTELEPHONE PROCEDURE

Assuming proper licensing for operation on 122.1 and 122.5 mc, it is essential that the accepted voice technique be used. A sample of this based on the March 1, 1946, issue of "Air Navigation Radio Aids" by CAA follows:

Uniformity in radiotelephone procedure is designed to aid in the speed and reliability of communications. The name of your airplane and the last four digits in your airplane license (NC) number should be used for your radio call, e. g. "Stinson 1234" or "Waco 4567." CAA tower and airways stations are referred to by the name of the city followed by "tower" or "radio" respectively. For example, the Jacksonville Airport tower and airways radio stations would be referred to respectively as "Jacksonville *tower*" and "Jacksonville *radio*."

Use the following form in calling:

"Jacksonville Radio, this is Stinson 1234—over."

Jacksonville Radio will reply:

"Stinson 1234, this is Jacksonville Radio—over."

Your message might then be:

"Jacksonville Radio, this is Stinson 1234—five miles south of Jacksonville, proceeding Daytona on contact flight plan filed with Augusta. No changes in ETA—over."

Jacksonville Radio will reply:

"Stinson 1234, this is Jacksonville Radio—Roger —out."

End a transmission with "OVER", if you expect a reply.

End a transmission with "OUT", if you do not expect a reply.

Use the expression "SAY AGAIN" when requesting a repeat.

Use the expression "I SAY AGAIN" in repeating.

Speak all transmissions clearly and distinctly, with the microphone close to the lips.

DO NOT CALL A STATION UNTIL YOU HAVE FIRST LISTENED TO MAKE CERTAIN IT IS NOT COMMUNICATING WITH ANOTHER STATION.

Call an airport control tower only for instructions regarding your use of that airport. Call airways stations for weather information, flight plans, notice of arrival and other routine communications connected with your flight.

TO CALL AN AIRPORT CONTROL TOWER ON 122.5 MC

(a) Turn the TRANS. FREQS. selector switch to position corresponding to 122.5 mc.

(b) Make certain that you have tuned in the station which you are about to call and that it is not now transmitting to someone else.

(c) Press the microphone button and talk clearly and distinctly with the lips practically touching the microphone. Careful speaking will reduce requests for repetition of your messages.

(d) Release the switch to listen.

(e) Sidetone has been provided so that you can hear yourself.

TO CALL AN AIRWAYS STATION ON 122.1 MC

(a) Turn the TRANS. FREQS. selector switch to position corresponding to 122.1 mc.

(b) Proceed as above in (b) to (d).

c. SPECIAL NOTE ON TWO-WAY VOICE OPERATING RANGE

It is difficult to rate the distance range of a communication equipment, but this equipment is rated at

30 miles at 3000 feet altitude for communication with an airways ground station. Ground stations often have many receivers operating simultaneously, and in order to reduce the confusion in the receiving station, the sensitivity or squelch controls on these are sometimes turned on so that only strong signals get through. In such cases it will be necessary to fly closer than normal before being able to put your call through. A test of your distance range may be made a part of normal communications.

SECTION IV

MECHANICAL AND ELECTRICAL CHARACTERISTICS

1. TYPE T-11A VHF TRANSMITTER

a. The T-11A VHF Transmitter is a 5-channel crystal-controlled, voice amplitude-modulated unit capable of operation in any one-megacycle band between the limits of 121.5 and 132 megacycles. Because of the narrow band, only one set of tuned circuits is required for the five crystal-controlled frequencies. The circuit consists of a crystal-controlled Pierce oscillator operating at 1/18th the final frequency, tripling in the plate of the first tube, tripling in the plate of the second tube, and doubling in the plate of the output PA tube. A fourth tube acts as an AF amplifier which plate-modulates the PA over 90%. All tubes are Type 6AQ5. The unmodulated carrier output power exceeds one watt. A single-button carbon microphone feeds into a 1 to 10 step-up microphone transformer. The modulator tube feeds into a 1 to 1.5 step-up transformer whose secondary plate-modulates the output of the PA. Sidetone to the headset line in the Receiver is obtained from the plate of the modulator tube through a capacitor. This sidetone provides interphone if the TRANS. FREQS. switch is on a position where no crystal is installed. HV for the Transmitter is obtained from the dynamotor attached to the Power Unit. A SPDT relay switches the HV from no load to transmit when the press-to-talk button on the microphone is pressed. A second SPDT relay is operated simultaneously with the HV relay to transfer the antenna connection from OFF to Transmitter. Provision is made on the Transmitter for connection of a VHF Receiver to operate from the A-12 Antenna Unit. Type "BNC" coax fittings are used.

b. The coax cable is 50 ohms, diameter .195 inches. Adapter, A. R. C. #11368, is available for connection of this cable to the larger coax receptacle as used on the streamlined, tapered mast Type AN-104 often used on military ships. Use of the small diameter coax saves many pounds in certain installations.

c. The Type T-11A Transmitter is available for operation on a 14-volt d-c supply as Type T-11A (14v) and for a 28-volt d-c supply as Type T-11A (28v). The 14v and 28v Transmitters are not interchangeable, due only to heater wiring but to the seven relays and the resistor in series with the microphone.

2. TYPE P-10 POWER UNIT AND TYPE D-10 DYNAMOTOR UNIT

a. The Type P-10 Power Unit acts as a shockmounting for the Type D-10 Dynamotor Unit and also as a means of interconnecting the units of the equipment. Some RF and AF filtering is accomplised in this unit. The Type D-10 Dynamotor is a completely enclosed unit with a continuous duty rating as follows:

DC INPUT		*DC OUTPUT*
14v TYPE	*28v TYPE*	*14v or 28v TYPE*
VOLTS 14	VOLTS 28	VOLTS 250
AMPS 2.7	AMPS 1.3	M. AMPS 60

3. TYPE C-13 CONTROL UNIT

a. Type C-13 Control Unit contains the power switch, the five-position TRANS. FREQS. switch, and a receptacle.

SECTION V

MAINTENANCE

PLEASE READ THE GUARANTEE ACCOMPANYING THE EQUIPMENT BEFORE SERVICING . . . . . .

1. PREVENTIVE MAINTENANCE

a. The following points should be given attention at approximately monthly intervals:

(1) Check that nuts on all plugs are hand tight. Use of a wrench on these nuts is not recommended.

(2) Check that the antenna and leads thereto are secure.

(3) Check that microphone plugs are secure and that cords are in satisfactory condition.

(4) Check that the Transmitter is secure on its mounting and that snapslides are properly locked.

(5) Check that the switches on the Control Unit dial are in good condition.

(6) Check for microphonics or clicks by listening to the headset response while striking the Transmitter during operation.

(7) If there is any evidence of loss of distance range, check the Transmitter output TEST voltage at each operating frequency.

b. Do not remove the equipment from the airplane unless trouble has developed which cannot be rectified on the spot.

2. SERVICING THE EQUIPMENT

a. EQUIPMENT REQUIRED:

(1) D-C Voltmeter having ranges of 3, 30, 300 volts. Voltages shown on diagrams were taken with a voltmeter having 1000 ohms per volt.

(2) Phantom Antenna. This may be a 50 ohm coaxial transmission line with a small (½ watt) 50 ohm carbon resistor connected from line to shield. Antenna Unit Type A-12 may be used for Transmitter tests provided it is mounted in the center of a metal plate or screen about a yard square, or larger. Do not attempt to make Transmitter tests using Antenna Unit Type A-12 without this "ground plane."

(3) 14 or 28 volts of storage battery, depending on whether the 14 or 28.volt equipment is being tested. A 12 (or 24) volt battery may be used if allowance is made for test voltages as shown on the circuit diagrams.

(4) A complete Type 18 equipment with cables, and with all tubes marked, will be helpful in determining trouble by the substitution method. Always keep a set of standard marked tubes.

b. TROUBLE-SHOOTING SUGGESTIONS BE CERTAIN TO CHECK THAT THE DYNAMOTOR AND TRANSMITTER BEING TESTED ARE THE 14 OR 28-VOLT TYPES BEFORE CONNECTING THE STORAGE BATTERY.

(1) Check the cabling according to Figure 4 and make certain that the input voltage is 14 or 28 volts with + to the white-yellow battery lead. If a 12 or 24 volt battery is used, voltages obtained will be lower than those shown on the diagrams. The transmitter power output at 12 (or 24) volts will be about half that at 14 (or 28) volts, respectively.

(2) Use the substitution method to locate the particular unit in which trouble exists.

(3) Have a standard set of tubes ready for insertion in the Transmitter.

(4) The schematic diagram in Figure 3 shows all important test voltages.

c. LOCATION OF TROUBLE IN THE TRANSMITTER

(1) After making certain the trouble cannot be cured by tube replacement, test for voltages shown on the schematic circuit diagram. The press-to-talk button on the microphone must be closed to provide HV to the Transmitter. The TRANS. FREQS. switch must be on a position corresponding to a crystal. (Only two crystals will be installed in some Transmitters.) All tests should be made at 14 (or 28) volts input or allowance made in the schematic circuit diagram values for other input voltages.

(2) Make a careful visual inspection for obvious mechanical defects.

(3) Check the crystal oscillator-tripler circuits by tuning L-54 (screw #1) to resonance as indicated by a dip of approximately 1.5 volts in the 7 volts developed across R-64 in the cathode of V-53.

(4) Check the operation up to the input to V-51 by tuning L-53 (screw #2) for a maximum reading on a d-c voltmeter connected across R-56. This should be approximately—75 volts.

(5) Check the RF output by tuning L-51 (screw #3) for maximum voltage at J-54 TEST point. This should read 1.5-2 volts d-c.

(6) Speak into the microphone and note a rise in the TEST voltage of 10-20%.

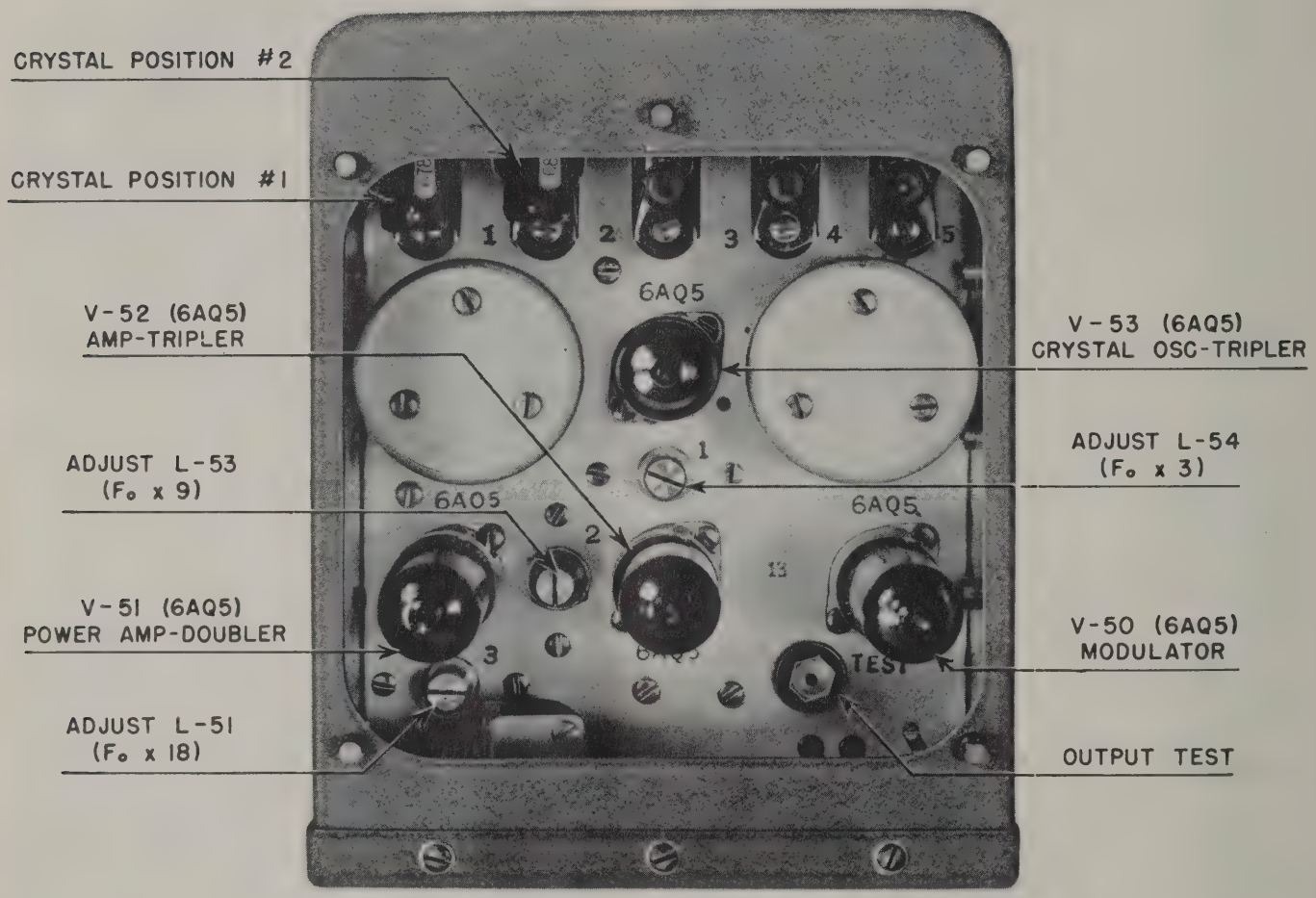

Figure 2—Top View of Transmitter, Tube Cover Removed

Crystals may be located in other positions than shown here. As many as five crystals may be installed as long as the operating frequency falls into any one-megacycle band between 121.5 and 132 megacycle.

NOTE REGARDING TYPE 6AQ5 TUBES IN THE TRANSMITTER

There is a wide variation in the output capacitance of Type 6AQ5 tubes as made at present by the several manufacturers. There are Type 6AQ5 tubes whose output capacitance is so much above the specification value that they may not be used in the V-51 Power Amplifier-Doubler socket, because it will not then be possible to tune L-51 over the entire frequency range of 121.5 to 132 mc. This will be evidenced by a lack of adjustment range on screw #3 which tunes L-51. If the full RF frequency range of the Transmitter is to be realized, use a Tungsol Type 6AQ5 in the V-51 socket. If operation in the band of 121.5 to 123 mc, *only*, is required, any manufacturer's Type 6AQ5 may be used in any socket.

SECTION VI
SUPPLEMENTARY DATA

TABLE 1

TYPICAL LIST OF MAJOR UNITS AND ACCESSORIES FOR TYPE 18 VHF TRANSMITTING EQUIPMENT

A. R. C. Type No.	*A. R. C. Part No.*	*Name (Description)*
T-11A(14v)	12408	Transmitter (VHF; includes Tubes and Crystals for 122.1 and 122.5 mc; Note 1).
T-11A(28v)	12409	
M-11A	12501	Mounting (Transmitter, shockproof).
P-10	12419	Power Unit (less Dynamotor Unit)
D-10(14v)	11903	Dynamotor Unit (mounts on Power Unit; choice for 14v or 28v supply).
D-10(28v)	12504	
C-13	12410	Control Unit (remote, Transmitter only).
M-16	9451	Mounting (for Control Unit).
A-12	12401	Antenna Unit (VHF, rod type).
—	—	Complement of Plugs and Bulk Cable. (This normally includes 20 feet each of bulk cable 11318, 11834, 11835; one each of plugs 12370 (or 9491), 12375 (or 9949); two each of plugs 11337, 12098 (or 11940), 12125 (or 11939); Note 2.).
—	—	Instruction Book and licensing data.

NOTES

(1) Transmitter may be adjusted for operation on any five frequencies within any one-megacycle band located between 121.5 and 132 mc. Crystals for 122.1 and 122.5 mc are supplied and the Transmitter is tuned for operation in the 122-123 mc band unless specifically ordered otherwise.

(2) A. R. C. is in the process of changing over from bakelite to ceramic insulation in all plugs. Where alternates are shown the number in parenthesis corresponds to the bakelite plug.

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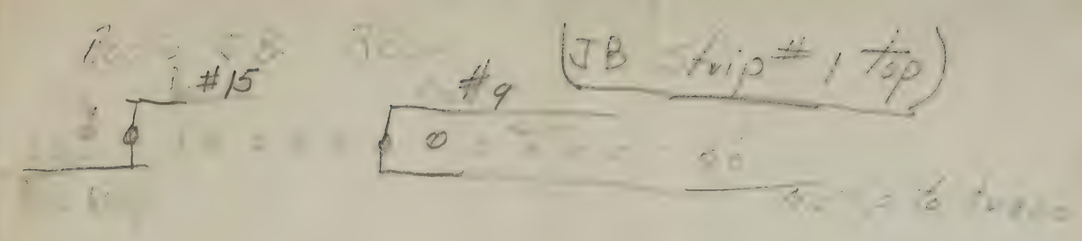
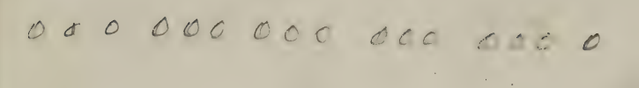
(2) A. R. C. is in the process of changing over from bakelite to ceramic insulation in all plugs. Where alternates are shown the number in parenthesis corresponds to the bakelite plug.

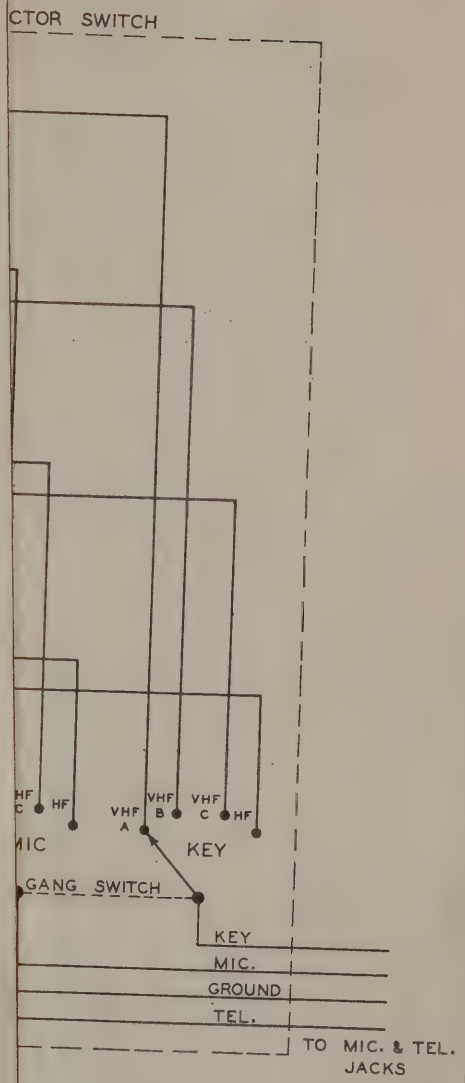




Unconnected #12 wire w/end in JB.

X

X



AGRAM
VHF EQUIPMENT
RANSMITTER OPERATION
ION, BOONTON, NEW JERSEY

VHF TRANSMITTER (121.5 - 132 MC) TYPE T-11A (14V) OR TYPE T-11A (28V)

POWER UNIT TYPE P-10

DYNAMOTOR UNIT TYPE D-10 (14V) OR TYPE D-10 (28V)

ANTENNA UNIT TYPE A-12

CONTROL UNIT TYPE C-13

Note
Cable ass. 12803
IRC color code
A- Black
B- Brown
C- Red
d- Orange
e- Yellow
f- Green

A B'
B- Br
C- Red
e- orange
f- Yellow
g- Grn
H- B/H

NOTES:
1. ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.
2. ALL CAPACITANCES ARE IN MICROMICROFARADS AND ALL RESISTANCES ARE IN OHMS UNLESS SPECIFICALLY INDICATED AS MFD FOR MICROFARADS AND MEG. FOR MEGOHMS RESPECTIVELY.
3. THE TWO CRYSTALS NORMALLY SUPPLIED ARE FOR OPERATION ON 122.1 AND 122.5 MC. THE REMAINING POSITIONS ARE PROVIDED FOR USE AT A LATER DATE.
4. (14V) AND (28V) FOLLOWING TYPE DESIGNATION NUMBERS SPECIFIES THE POWER SUPPLY VOLTAGE, LV.
5. D-C VOLTAGES IN PARENTHESES ARE THE APPROXIMATE VALUES OBTAINED WHILE TRANSMITTING WITH THE SOURCE VOLTAGE AT 14 OR 28 VOLTS.
6. ALL CERAMIC RECEPTACLES HAVE TERMINALS LETTERED A, B, C, D, ETC. CORRESPONDING TO BAKELITE RECEPTACLES HAVING TERMINALS NUMBERED 1, 2, 3, 4, ETC.

JUNE 13, 1947

Figure 3—Schematic Circuit Diagram, Type 18 VHF Transmitting Equipment

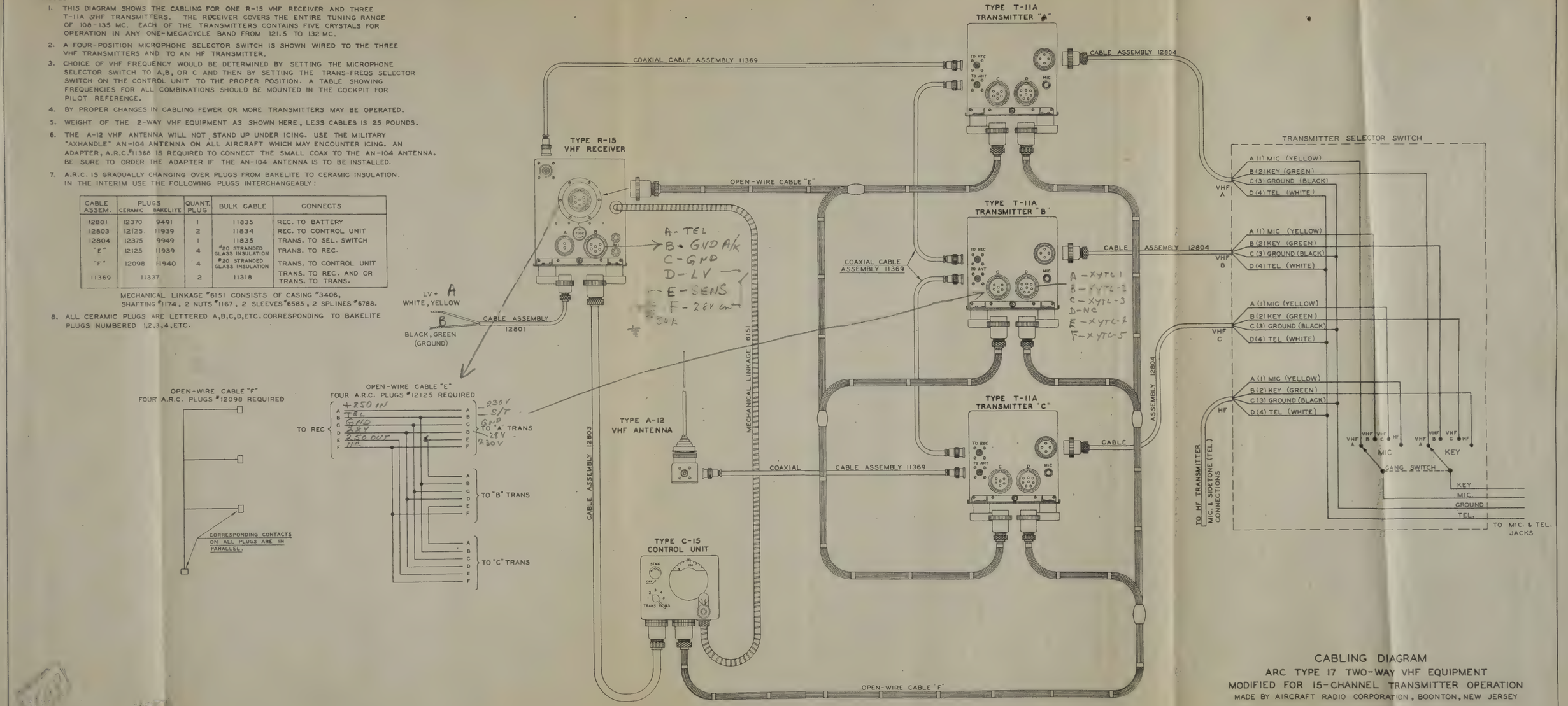
NOTES:

1. THIS DIAGRAM SHOWS THE CABLING FOR ONE R-15 VHF RECEIVER AND THREE T-11A VHF TRANSMITTERS. THE RECEIVER COVERS THE ENTIRE TUNING RANGE OF 108-135 MC. EACH OF THE TRANSMITTERS CONTAINS FIVE CRYSTALS FOR OPERATION IN ANY ONE-MEGACYCLE BAND FROM 121.5 TO 132 MC.
2. A FOUR-POSITION MICROPHONE SELECTOR SWITCH IS SHOWN WIRED TO THE THREE VHF TRANSMITTERS AND TO AN HF TRANSMITTER.
3. CHOICE OF VHF FREQUENCY WOULD BE DETERMINED BY SETTING THE MICROPHONE SELECTOR SWITCH TO A, B, OR C AND THEN BY SETTING THE TRANS-FREQS SELECTOR SWITCH ON THE CONTROL UNIT TO THE PROPER POSITION. A TABLE SHOWING FREQUENCIES FOR ALL COMBINATIONS SHOULD BE MOUNTED IN THE COCKPIT FOR PILOT REFERENCE.
4. BY PROPER CHANGES IN CABLING FEWER OR MORE TRANSMITTERS MAY BE OPERATED.
5. WEIGHT OF THE 2-WAY VHF EQUIPMENT AS SHOWN HERE, LESS CABLES IS 25 POUNDS.
6. THE A-12 VHF ANTENNA WILL NOT STAND UP UNDER ICING. USE THE MILITARY "AXHANDLE" AN-104 ANTENNA ON ALL AIRCRAFT WHICH MAY ENCOUNTER ICING. AN ADAPTER, A.R.C. #11368 IS REQUIRED TO CONNECT THE SMALL COAX TO THE AN-104 ANTENNA. BE SURE TO ORDER THE ADAPTER IF THE AN-104 ANTENNA IS TO BE INSTALLED.
7. A.R.C. IS GRADUALLY CHANGING OVER PLUGS FROM BAKELITE TO CERAMIC INSULATION. IN THE INTERIM USE THE FOLLOWING PLUGS INTERCHANGEABLY:

CABLE ASSEM.	PLUGS CERAMIC	PLUGS BAKELITE	QUANT. PLUG	BULK CABLE	CONNECTS
12801	12370	9491	1	11835	REC. TO BATTERY
12803	12125	11939	2	11834	REC. TO CONTROL UNIT
12804	12375	9949	1	11835	TRANS. TO SEL. SWITCH
"E"	12125	11939	4	#20 STRANDED GLASS INSULATION	TRANS. TO REC.
"F"	12098	11940	4	#20 STRANDED GLASS INSULATION	TRANS. TO CONTROL UNIT
11369	11337		2	11318	TRANS. TO REC. AND OR TRANS. TO TRANS.

MECHANICAL LINKAGE #6151 CONSISTS OF CASING #3406, SHAFTING #1174, 2 NUTS #1167, 2 SLEEVES #6585, 2 SPLINES #6788.

8. ALL CERAMIC PLUGS ARE LETTERED A,B,C,D,ETC. CORRESPONDING TO BAKELITE PLUGS NUMBERED 1,2,3,4,ETC.



CABLING DIAGRAM
ARC TYPE 17 TWO-WAY VHF EQUIPMENT
MODIFIED FOR 15-CHANNEL TRANSMITTER OPERATION

MADE BY AIRCRAFT RADIO CORPORATION, BOONTON, NEW JERSEY

12560-A

JUNE 25, 1947

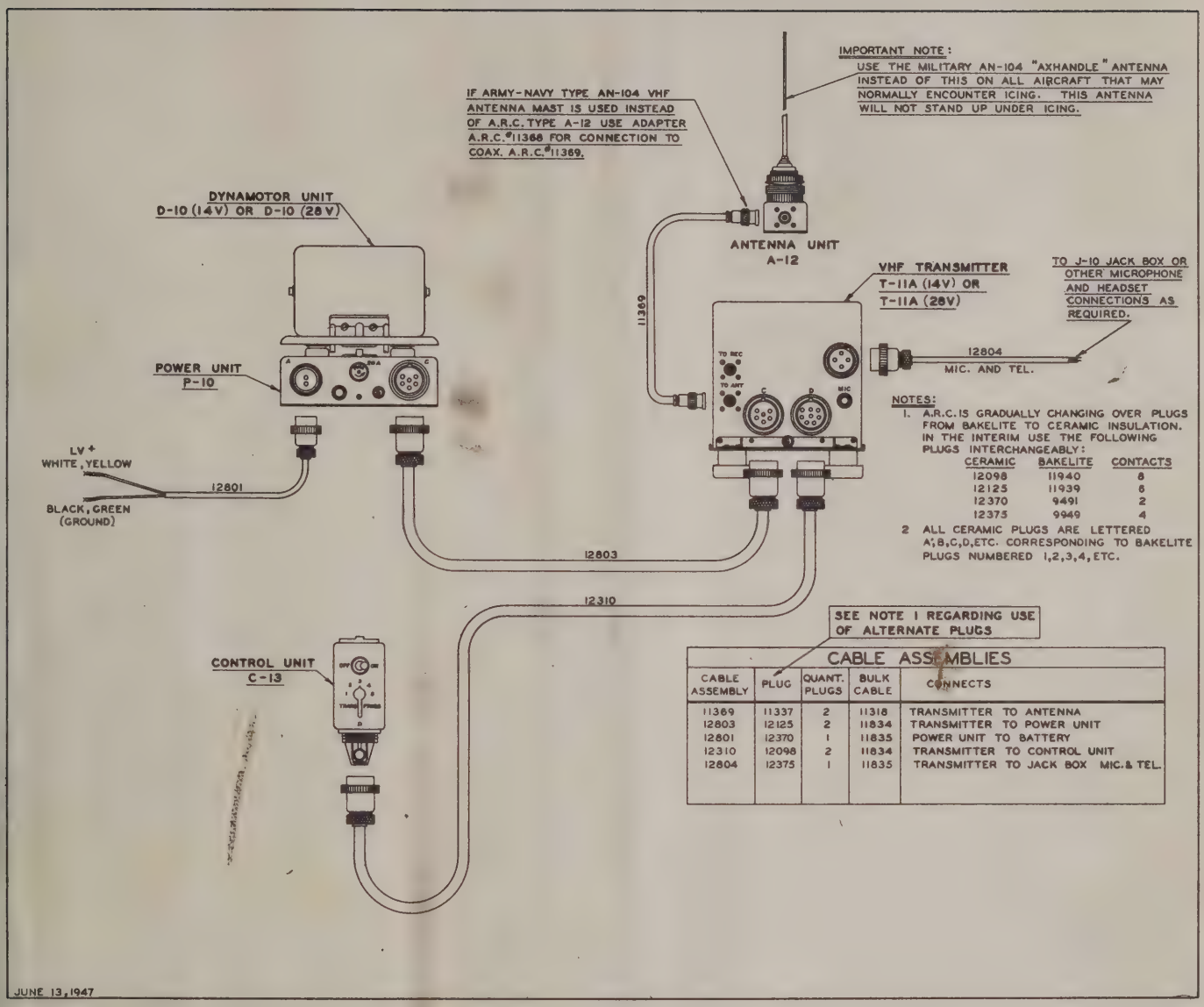
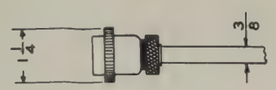

IMPORTANT NOTE:
USE THE MILITARY AN-104 "AXHANDLE" ANTENNA INSTEAD OF THIS ON ALL AIRCRAFT THAT MAY NORMALLY ENCOUNTER ICING. THIS ANTENNA WILL NOT STAND UP UNDER ICING.
IF ARMY-NAVY TYPE AN-104 VHF ANTENNA MAST IS USED INSTEAD OF A.R.C. TYPE A-12 USE ADAPTER A.R.C.#11368 FOR CONNECTION TO COAX. A.R.C.#11369.
DYNAMOTOR UNIT D-10 (14V) OR D-10 (28V)
ANTENNA UNIT A-12
VHF TRANSMITTER T-11A (14V) OR T-11A (28V)
TO J-10 JACK BOX OR OTHER MICROPHONE AND HEADSET CONNECTIONS AS REQUIRED.
11369
12804
MIC. AND TEL.
POWER UNIT P-10
LV+ WHITE, YELLOW
12801
BLACK, GREEN (GROUND)
12803
12310
CONTROL UNIT C-13
NOTES:
1. A.R.C. IS GRADUALLY CHANGING OVER PLUGS FROM BAKELITE TO CERAMIC INSULATION. IN THE INTERIM USE THE FOLLOWING PLUGS INTERCHANGEABLY:
CERAMIC BAKELITE CONTACTS
12098 11940 8
12125 11939 6
12370 9491 2
12375 9949 4
2 ALL CERAMIC PLUGS ARE LETTERED A,B,C,D,ETC. CORRESPONDING TO BAKELITE PLUGS NUMBERED 1,2,3,4, ETC.
SEE NOTE 1 REGARDING USE OF ALTERNATE PLUGS
CABLE ASSEMBLIES
CABLE ASSEMBLY | PLUG | QUANT. PLUGS | BULK CABLE | CONNECTS
11369 | 11337 | 2 | 11318 | TRANSMITTER TO ANTENNA
12803 | 12125 | 2 | 11834 | TRANSMITTER TO POWER UNIT
12801 | 12370 | 1 | 11835 | POWER UNIT TO BATTERY
12310 | 12098 | 2 | 11834 | TRANSMITTER TO CONTROL UNIT
12804 | 12375 | 1 | 11835 | TRANSMITTER TO JACK BOX MIC.& TEL.
JUNE 13, 1947

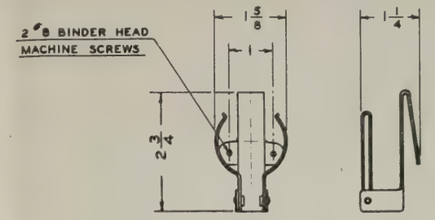
Figure 4—Cabling Diagram, Type 18 VHF Transmitting Equipment



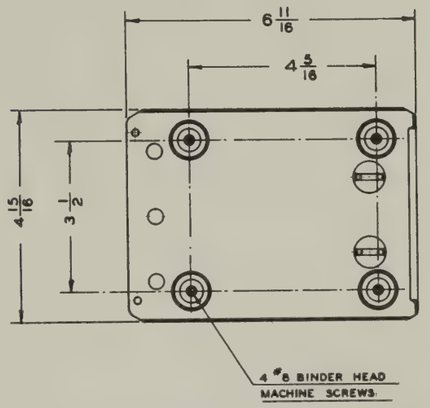
CABLE "A"

CABLE "C"

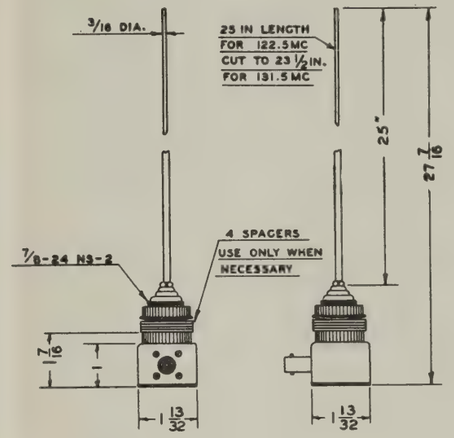
CABLE "B"



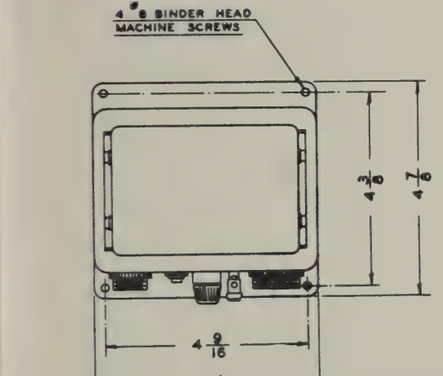
MICROPHONE BRACKET
#11936

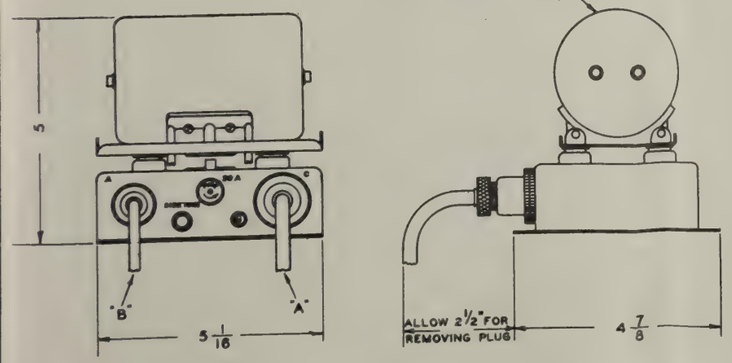


TYPE M-11A MOUNTING

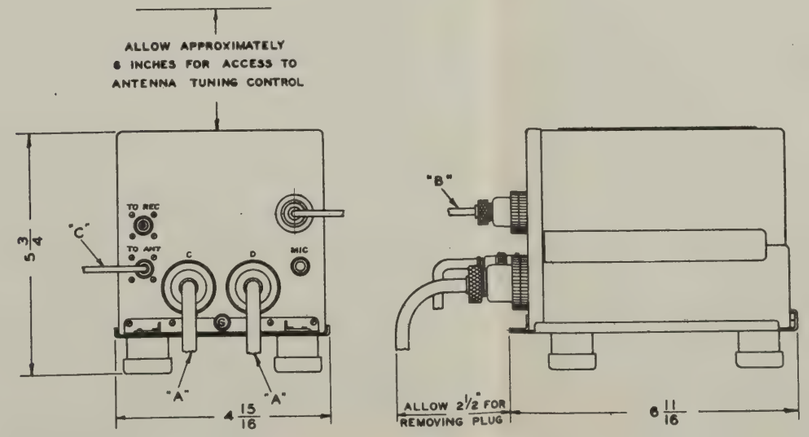


TYPE A-12 ANTENNA UNIT





TYPE P-10 POWER UNIT

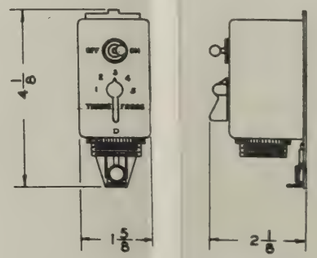


TYPE T-11A VHF TRANSMITTER
(14 V OR 28V)

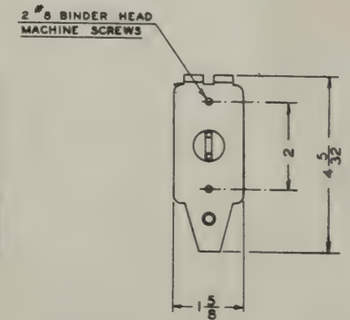
NO. REQ. PER INSTALLATION		WEIGHT POUNDS
1	T-11A TRANSMITTER WITH TUBES, FIVE CRYSTALS, & M-11A MOUNTING	3.4
1	P-10 POWER UNIT WITH DYNAMOTOR	3.8
1	C-13 CONTROL UNIT WITH M-16 MOUNTING	0.3
1	A-12 ANTENNA UNIT	0.25
1	MICROPHONE	0.45
1	MICROPHONE SOCKET	0.06
1	* BATTERY CABLE PER FOOT	0.07
1	* TRANSMITTER TO CONTROL UNIT CABLE PER FOOT	0.14
1	* TRANSMITTER TO POWER UNIT CABLE PER FOOT	0.14
1	* VHF ANTENNA CABLE PER FOOT	0.04

TABLE OF WEIGHTS

* FOURTH WEIGHT OF FOUR FOOT ASSEMBLY



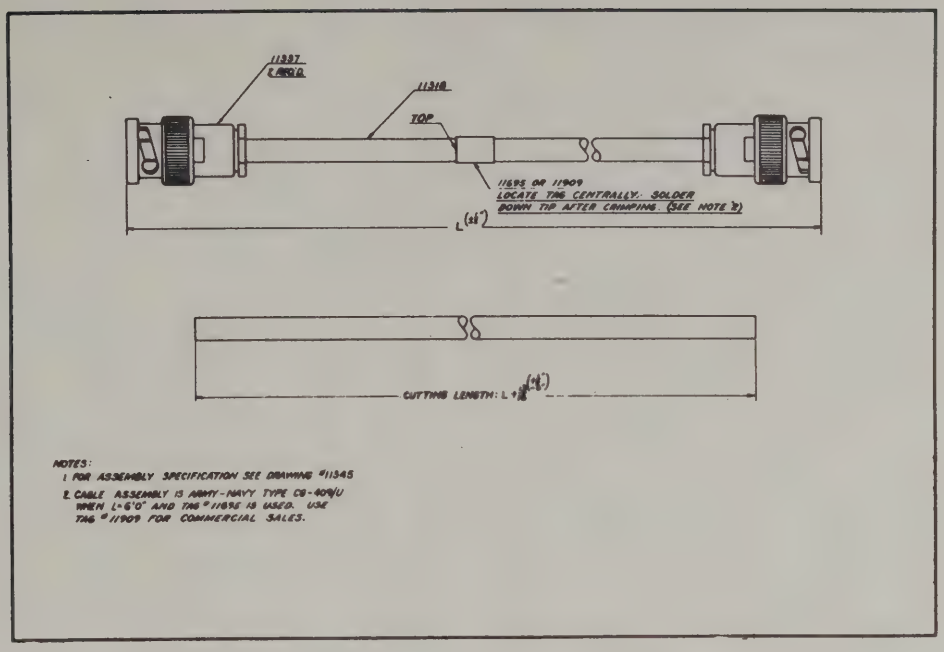
TYPE C-13 CONTROL UNIT



TYPE M-16 MOUNTING

JUNE 13, 1947

Figure 5—Installation Dimensions and Weights, Type 18 VHF Transmitting Equipment


11337
(REF.)
11318
TOP
11895 OR 11909
LOCATE TAG CENTRALLY. SOLDER
DOWN TIP AFTER CRIMPING. (SEE NOTE 2)
L (as req'd)
CUTTING LENGTH: L + 1/2 (4")
NOTES:
1. FOR ASSEMBLY SPECIFICATION SEE DRAWING #11345
2. CABLE ASSEMBLY IS ARMY-NAVY TYPE CG-409/U
WHEN L=6'0" AND TAG # 11895 IS USED. USE
TAG # 11909 FOR COMMERCIAL SALES.

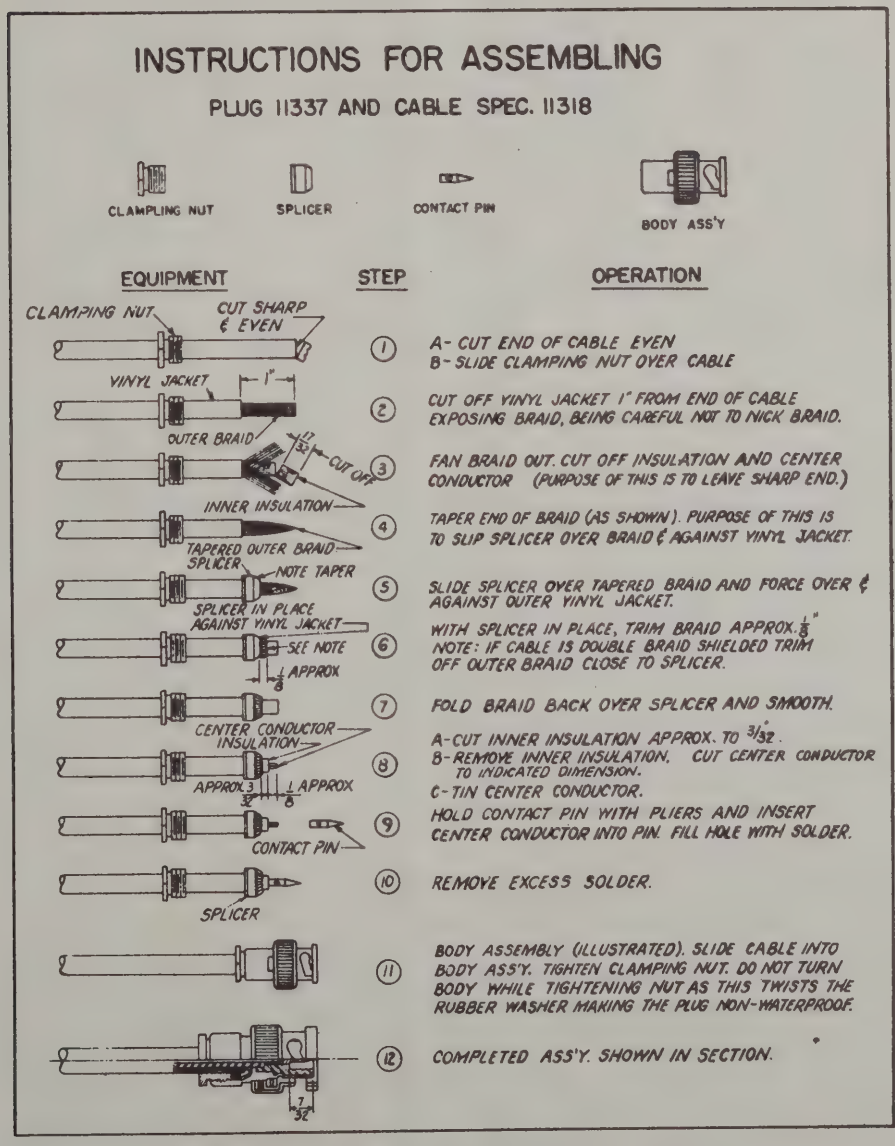

INSTRUCTIONS FOR ASSEMBLING
PLUG 11337 AND CABLE SPEC. 11318
CLAMPLING NUT
SPLICER
CONTACT PIN
BODY ASS'Y
EQUIPMENT
STEP
OPERATION
CLAMPING NUT
CUT SHARP & EVEN
1
A- CUT END OF CABLE EVEN
B- SLIDE CLAMPING NUT OVER CABLE
VINYL JACKET
1"
2
CUT OFF VINYL JACKET 1" FROM END OF CABLE EXPOSING BRAID, BEING CAREFUL NOT TO NICK BRAID.
OUTER BRAID
17/32
CUT OFF
3
FAN BRAID OUT. CUT OFF INSULATION AND CENTER CONDUCTOR (PURPOSE OF THIS IS TO LEAVE SHARP END.)
INNER INSULATION
TAPERED OUTER BRAID
4
TAPER END OF BRAID (AS SHOWN). PURPOSE OF THIS IS TO SLIP SPLICER OVER BRAID & AGAINST VINYL JACKET.
SPLICER
NOTE TAPER
5
SLIDE SPLICER OVER TAPERED BRAID AND FORCE OVER & AGAINST OUTER VINYL JACKET.
SPLICER IN PLACE AGAINST VINYL JACKET
SEE NOTE
1/8 APPROX
6
WITH SPLICER IN PLACE, TRIM BRAID APPROX. 1/8"
NOTE: IF CABLE IS DOUBLE BRAID SHIELDED TRIM OFF OUTER BRAID CLOSE TO SPLICER.
7
FOLD BRAID BACK OVER SPLICER AND SMOOTH.
CENTER CONDUCTOR INSULATION
APPROX. 3/32
1/8 APPROX
8
A- CUT INNER INSULATION APPROX. TO 3/32.
B- REMOVE INNER INSULATION. CUT CENTER CONDUCTOR TO INDICATED DIMENSION.
C- TIN CENTER CONDUCTOR.
CONTACT PIN
9
HOLD CONTACT PIN WITH PLIERS AND INSERT CENTER CONDUCTOR INTO PIN. FILL HOLE WITH SOLDER.
SPLICER
10
REMOVE EXCESS SOLDER.
11
BODY ASSEMBLY (ILLUSTRATED). SLIDE CABLE INTO BODY ASS'Y. TIGHTEN CLAMPING NUT. DO NOT TURN BODY WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE PLUG NON-WATERPROOF.
7/32
12
COMPLETED ASS'Y. SHOWN IN SECTION.

Figure 6—Instructions for Assembling Coax Cable

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, UNITED STATES AIR FORCE
WASHINGTON

TECHNICAL ORDER
NO. 01-1-229

10 August 1948

INSTALLATION OF STATIC DISCHARGERS AN/ASA-3 – B-17, B-25, B-26, RB-26, B-29, RB-29, C-46, C-47, C-54, AND C-117 – ALL SERIES

This technical order replaces T. O. Nos. 01-1-229, dated 5 March 1945, and 01-1-229A, dated 25 July 1945, revised to include B-26 and RB-26 series aircraft, and to incorporate instructions for periodic maintenance of dischargers.

By whom work will be accomplished: Organizational maintenance activities, with the aid of field maintenance facilities if necessary.

When work will be accomplished: As soon as practicable. No additional modification is required on aircraft which show compliance with T. O. No. 01-1-229, dated 5 March 1945.

AF form entry required: 60-A. Reference to the periodic work prescribed in paragraph 3. will be entered in the applicable aircraft inspection and maintenance technical order (inspection guide).

1. Static Dischargers AN/ASA-3 will be installed in the subject aircraft if not already present. Subject static dischargers are contractor installed on certain bombardment and transport aircraft prior to delivery. Effective points available at this printing are as follows:

MODEL	AF SERIAL NOS.
B-25J-NC	44-30811
C-47B-DK	44-76335
C-54D-DC	42-72640
C-54E-DO	44-9036
C-54G-DC	All
C-54G-DO	All
C-117A-DK	45-2545

Contractor and modification center installations of AN/ASA-3 on specific aircraft may vary somewhat from the general instructions contained herein. These deviations will not be construed as cause for rework or rejection. Static Dischargers AN/ASA-3 installed on the foregoing and future aircraft will be maintained in accordance with paragraph 3.

2. INSTALLATION.

a. If Static Dischargers AN/ASA-1 or AN/ASA-1A are installed, remove the dischargers and their brackets, and rework the bracket side in accordance with standard AF procedure.

b. If Static Dischargers AN/ASA-3 are not present, install as follows:

(1) For aircraft with 1 vertical stabilizer, install 12 Static Dischargers AN/ASA-3 in accordance with figure 1, using parts listed in paragraph 4.a.

(2) For aircraft with 2 vertical stabilizers, install 10 Static Dischargers AN/ASA-3 in accordance with figure 2, using parts listed in paragraph 4.b.

3. PERIODIC MAINTENANCE.

a. To prevent increased likelihood of precipitation static effects due to impairment of discharger efficiency in consequence of a washing out of the exposed tip of wicking, all Static Dischargers AN/ASA-3 installed on an aircraft will be trimmed, or replaced if required, at the time of each 100-hour inspection of the aircraft. Trimming will be accomplished as follows:

(1) Cut wicking off even with trailing end of plastic tubing.

(2) Cut and remove a one inch length from trailing end of plastic tubing, using care to prevent cutting of the wicking.

(3) Fan out the newly exposed part of the wick to provide proper discharge effect.

(4) The discharger will be replaced when the distance from trailing edge of surface on which discharger is mounted, to trailing end of discharger is less than six inches.

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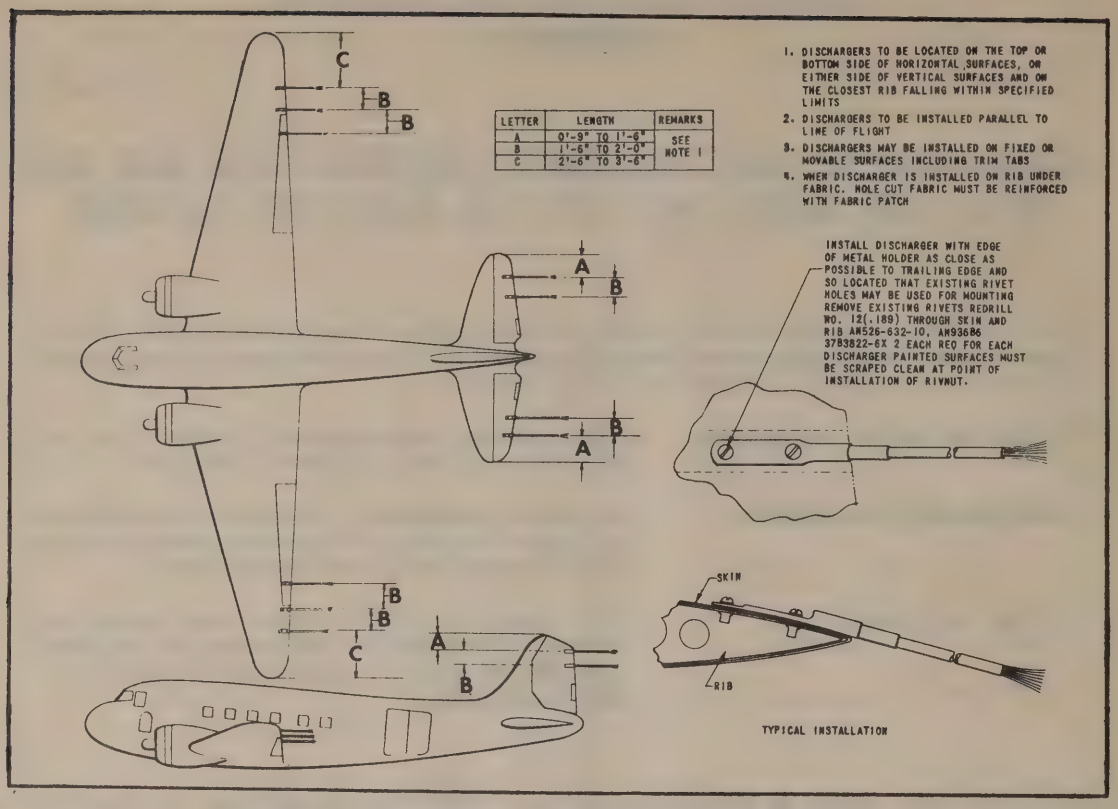
C
B
B
A
B
B
A
B
B
C
A
B
LETTER
LENGTH
REMARKS
A
0'-9" TO 1'-6"
B
1'-6" TO 2'-0"
C
2'-6" TO 3'-6"
SEE NOTE 1
1. DISCHARGERS TO BE LOCATED ON THE TOP OR BOTTOM SIDE OF HORIZONTAL SURFACES, OR EITHER SIDE OF VERTICAL SURFACES AND ON THE CLOSEST RIB FALLING WITHIN SPECIFIED LIMITS
2. DISCHARGERS TO BE INSTALLED PARALLEL TO LINE OF FLIGHT
3. DISCHARGERS MAY BE INSTALLED ON FIXED OR MOVABLE SURFACES INCLUDING TRIM TABS
4. WHEN DISCHARGER IS INSTALLED ON RIB UNDER FABRIC. HOLE CUT FABRIC MUST BE REINFORCED WITH FABRIC PATCH
INSTALL DISCHARGER WITH EDGE OF METAL HOLDER AS CLOSE AS POSSIBLE TO TRAILING EDGE AND SO LOCATED THAT EXISTING RIVET HOLES MAY BE USED FOR MOUNTING REMOVE EXISTING RIVETS REDRILL NO. 12(.189) THROUGH SKIN AND RIB AN526-632-10, AN93686 37B3822-6X 2 EACH REQ FOR EACH DISCHARGER PAINTED SURFACES MUST BE SCRAPED CLEAN AT POINT OF INSTALLATION OF RIVNUT.
SKIN
RIB
TYPICAL INSTALLATION

Figure 1 - Installation of Static Discharger (Typical)

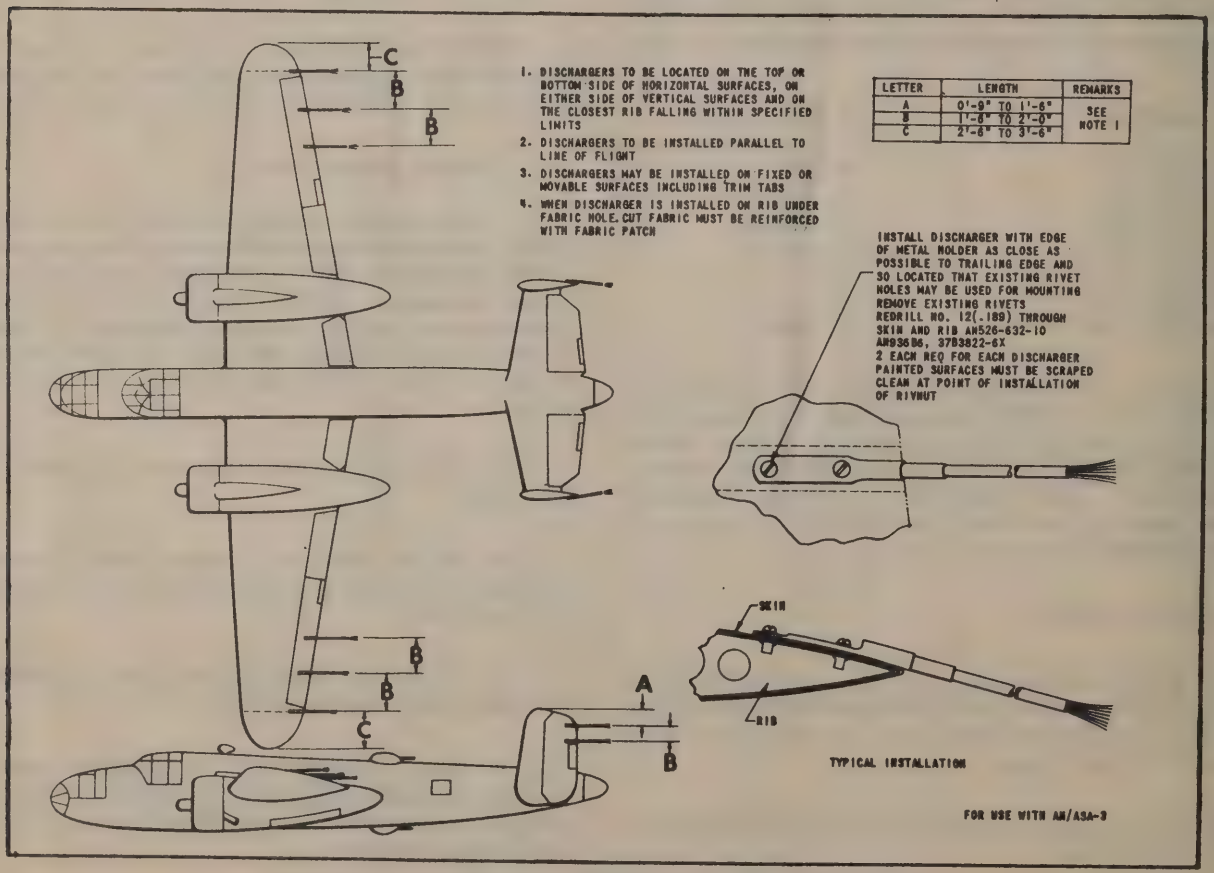
C
B
B
B
B
C
A
B
1. DISCHARGERS TO BE LOCATED ON THE TOP OR BOTTOM SIDE OF HORIZONTAL SURFACES, OR EITHER SIDE OF VERTICAL SURFACES AND ON THE CLOSEST RIB FALLING WITHIN SPECIFIED LIMITS
2. DISCHARGERS TO BE INSTALLED PARALLEL TO LINE OF FLIGHT
3. DISCHARGERS MAY BE INSTALLED ON FIXED OR MOVABLE SURFACES INCLUDING TRIM TABS
4. WHEN DISCHARGER IS INSTALLED ON RIB UNDER FABRIC HOLE. CUT FABRIC MUST BE REINFORCED WITH FABRIC PATCH
LETTER
LENGTH
REMARKS
A
0'-9" TO 1'-6"
B
1'-6" TO 2'-0"
C
2'-6" TO 3'-6"
SEE NOTE 1
INSTALL DISCHARGER WITH EDGE OF METAL HOLDER AS CLOSE AS POSSIBLE TO TRAILING EDGE AND SO LOCATED THAT EXISTING RIVET HOLES MAY BE USED FOR MOUNTING REMOVE EXISTING RIVETS REDRILL NO. 12(.189) THROUGH SKIN AND RIB AN526-632-10 AN93686, 37B3822-6X 2 EACH REQ FOR EACH DISCHARGER PAINTED SURFACES MUST BE SCRAPED CLEAN AT POINT OF INSTALLATION OF RIVNUT
SKIN
RIB
TYPICAL INSTALLATION
FOR USE WITH AN/ASA-3

Figure 2 - Installation of Static Discharger (Typical)

4. The following parts are required per aircraft and will be obtained by requisition submitted through normal channels.

a. FOR AIRCRAFT WITH ONE VERTICAL STABILIZER.

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
12	1600-296469920	2Z8882-3	Static Discharger AN/ASA-3	16-A	AF Stock
24	6700-785540-32	AN526-632-10	Screw - Truss head steel 6-32 x 5/8 in.	29	AF Stock
24	6700-991480	AN936B6	Washer - Lock steel external teeth style B No. 6 bolt	29	AF Stock
24	6700-570750	37B3822-6X	Rivet - Threaded, open end with key	29	AF Stock

b. FOR AIRCRAFT WITH TWO VERTICAL STABILIZERS.

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
10	1600-296469920	2Z8882-3	Static Discharger AN/ASA-3	16-A	AF Stock
20	6700-785540-32	AN526-632-10	Screw - Truss head steel 6-32 x 5/8 in.	29	AF Stock
20	6700-991480	AN936B6	Washer - Lock steel external teeth style B No. 6 bolt	29	AF Stock
20	6700-570750	37B3822-6X	Rivet - Threaded, open end with key	29	AF Stock

c. Static Dischargers AN/ASA-1 or AN/ASA-1A and their brackets removed in accordance with the preceding instructions and like items in stock will be condemned at once and so tagged for disposition as administratively condemned property.

5. The effect of this change on weight and balance is negligible.

BY ORDER OF THE SECRETARY OF THE AIR FORCE:

HOYT S. VANDENBERG
Chief of Staff
United States Air Force

JOSEPH T. McNARNEY
General, United States Air Force
Commanding General
Air Materiel Command

Prepared by Maintenance Technical Section,
Maintenance Div, Hq, AMC.

The above Technical Order is reprinted through the courtesy of Air Materiel Command, Wright-Patterson Air Force Base, U. S. Air Force.

(OVER)

DAYTON AIRCRAFT PRODUCTS, INC.

342 XENIA AVE., DAYTON 10, OHIO
BOX 27 ★ ★ STATION D
TELEPHONE ★ KE. 6189
GEO. W. HOUK ★ President

ROBERT PATTERSON ★ V. P. & Treas

The attached Technical Order describes the installation of static wick dischargers on aircraft. The AN/ASA-3 is made to Specification AN-D-18, which calls for impregnating the cotton wicking with silver. This is done by the electrochemical deposition of silver particles into the cotton fibers which, by chemical oxidation, mechanical vibration and/or physical "washing out" of the silver particles, changes the resistance characteristics of the dischargers. Accordingly, on Page 1, Paragraph 3, Periodic Maintenance, Sub a., the silver wicks "will be trimmed or replaced if required, at the time of each 100-hour inspection of the aircraft". This is not required with the Dayton Aircraft 'Carbowick', which is made by chemically bonding carbon to the fibers by use of a synthetic resin. After hundreds of hours of running water and static saturation tests, the resistance remains unchanged. Trimming will be required only when the exposed wicking frays off from mechanical abrasion.

A new specification covering the Dayton Aircraft 'Carbowick' will be prepared in the near future, as it not only meets the present resistance specification, but stays within much closer limits of resistivity due to our production control.

These wicks are fully guaranteed within the terms set forth by our standard terms and conditions on anti-static antenna fittings.

AERONAUTICAL RADIO MFG. CO.
155 FIRST ST. PHONE GC 6770
MINEOLA, L. I., NEW YORK

AERONAUTICAL RADIO MFG. CO.
155 FIRST ST. PHONE GC 6770
MINEOLA, L. I., NEW YORK